

## DIETARY GENDER DIFFERENCES IN TERMS OF THE RISK OF ATHEROGENESIS IN POLAND\*

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### ABSTRACT

**Introduction.** Diet plays an important role in prevention of atherosclerosis. The objective of the study was to assess differences in the dietary intake and nutritional status in women and men in terms of atherogenesis risk.

**Material and methods.** The study involved 41 women and 49 men aged 40+. The nutrient intake was assessed using 7-day dietary records. The nutritional status was estimated on the basis of antropometric measurements and biochemical blood parameters. The differences between diets and the nutritional status depending on sex was evaluated by oneway analysis of variance. The dependencies between the nutritional status and the diet factors were assessed using multiple regression.

**Results and discussion.** It was found that a significant proportion of the women and men were overweight or obese, had lipid disorders and impaired fasting glucose. Diets of women and men were poorly balanced. A significant correlation between the level of energy from protein, as well as the energy supply and the LDL cholesterol concentration was found in the women. A positive correlation between energy from protein as well as total energy in the diet and body weight, was observed in women and men. Moreover, protein intake was positively correlated with BMI and waist circumference among the men. In the men, the level of serum triglycerides correlated with an increase in dietary cholesterol and a decrease in energy value.

**Conclusion.** This study indicates that an inadequate diet among both men and women represents a real health danger of developing atherosclerotic plaque.

**Key words:** lipid disorders, nutritional status, nutrition, atherosclerosis

### INTRODUCTION

Cardiovascular diseases (CVDs) are responsible for over 17.3 million deaths per year and are the leading causes of death in the world (Mendis et al., 2011). The atherosclerosis process plays an important role in the pathogenesis of the CVDs. Dyslipidemia, next to hypertension, is a major factor that promotes the process of atherosclerosis. Most authors suggested that adequate nutrition is one of the most important

prevention methods against atherosclerosis and its complications. An appropriate diet can decrease lipid concentration. Low dietary intakes of saturated fatty acids (SFA), cholesterol and salt, and high intake of fruits, vegetables and fish prevent the atherogenesis process. The next risk factor, closely linked to diet and physical inactivity, is obesity. Maintaining the proportion between energy requirements and its expenditure

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prevents overweight and obesity. An appropriate diet, as a modifiable risk factor, is the base of lipid disorders treatment. Diet constitutes a necessary addition to pharmacotherapy and increases the effectiveness of thereof and, in some cases, reduces the need for pharmacotherapy (Mendis et al., 2011; Report..., 2003).

## MATERIAL AND METHODS

The study included 41 women aged  $57.3 \pm 7.3$  years, and 49 men aged  $57.4 \pm 7.7$  years. A test group were taken from Wielkopolska region and it was random, potentially healthy people. The protocol of the study was approved by the Research Ethics Committee of Poznan University of Medical Sciences and registered as no. 1016/13. All participants provided written informed consent. To evaluate diet used a 7-day dietary record. The energy value and nutrient content in daily food rations (DFRs) of patients were calculated using the Dietetyk computer programme by JuMaR. The data recorded from all 90 diets were compared to the recommended daily allowances respective for a given sex, age, body mass and physical activity and the average percentage of the reference daily intake was determined. On the basis of the guidelines of national and world experts from the Polish Forum for Prevention, Food and Nutrition Institute in Warsaw, National Cholesterol Education Program Adult Treatment Panel III (ATP III) and World Health Organization a model of health-promoting nutrition was established. It was assumed that proteins, carbohydrates and fats should constitute 12%, 58% and 30% of energy value of a diet; SFA, monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) should provide 10%, 12% and 8% of the daily energy requirement, respectively. The upper limit for cholesterol intake was set at 300 mg (Jarosz, 2012; Kłosiewicz-Latoszek et al., 2008; National cholesterol..., 2002; Report..., 2003).

The nutritional status was estimated on the basis of anthropometric measurements and biochemical blood parameters (total cholesterol (TC), low- and high-density lipoprotein (LDL and HDL) cholesterol, triacylglycerols (TG), fasting blood glucose level). Laboratory analyses were performed at a certified analytical laboratory. Blood samples were collected after 7 days of conducting a nutritional diary from the subjects, who had fasted for minimum 12 hours before

venepuncture. Serum TC, HDL-cholesterol and TG levels were determined using standard methods on an Abbott ARCHITECT ci4100 analyzer. LDL-cholesterol was calculated using the Friedewald's formula (Friedewald et al., 1972). Glucose levels were determined in the Abbott ARCHITECT ci4100 using the Hexokinase/G-6-PDH reagent kit. The obtained values of the lipid profile compared with the guidelines of the European Society of Cardiology from 2003 (De Backer et al., 2003). The fasting glucose levels compared with the guidelines of the American Diabetes Association (García-Alcalá et al., 2012).

The differences between the intake of energy and nutrients, anthropometric parameters, lipid profile and glucose level depending on the sex of the patients was evaluated by oneway analysis of variance (ANOVA). The dependencies between anthropometric and biochemical parameters and diet factors (energy value and nutritive value of DFRs) were assessed using multiple regression.

## RESULTS

It was found that the average BMI value for the men fell within the range considered as overweight, while the mean BMI for the women was in the normal range (Jarosz et al., 2010; Table 1). However, an analysis of the distribution of the women and men in different BMI classes showed that 56% of the women and only 31% of the men had normal body weight, while

**Table 1.** Selected anthropometric parameters in patients ( $\bar{x} \pm SD$ )

Parameter	Examined group	
	women	men
Body weight, kg	62.92 $\pm$ 6.78 <sup>b</sup>	82.12 $\pm$ 15.21 <sup>a</sup>
BMI, kg/m <sup>2</sup>	24.70 $\pm$ 2.80	27.93 $\pm$ 9.52
Waist circumference, cm	80.15 $\pm$ 7.41 <sup>b</sup>	96.62 $\pm$ 11.42 <sup>a</sup>
Hip circumference, cm	99.16 $\pm$ 5.72 <sup>b</sup>	102.34 $\pm$ 6.65 <sup>a</sup>
WHR	0.81 $\pm$ 0.05 <sup>b</sup>	0.94 $\pm$ 0.07 <sup>a</sup>

<sup>a, b</sup>Statistically significant difference between women and men in the examined group at  $p < 0.05$ .

41% of the women and 45% of the men were found to be overweight. Obesity was recorded in 2% of the women, while nearly one quarter of the men were obese. The average waist circumference (WC) was significantly lower in the women than in the men and for both sexes it exceeded the boundary values (Jarosz et al., 2010). Disturbing data were obtained from the assessment of body type based on WHR (waist to hip ratio). Namely, the majority of women (61%) and 27% of men were characterised by the abdominal obesity. The mean TC and LDL level in both the women and men exceeded the reference values (Table 2). Although the average values of the other parameters of the lipid profile did not exceed the reference values, as many as 22% of the women and 27% of the men had elevated TG levels. Moreover, a reduced concentration of the HDL fraction was recorded in 7% of the women and 8% of the men. The mean fasting glucose concentration was within the normal range, but in 35% of the men and 22% of the women the reference values were exceeded.

**Table 2.** Selected biochemical blood parameters in patients ( $\bar{x} \pm \text{SD}$ )

Parameter	Examined group	
	women	men
Total cholesterol, mg/dl	213.17 ±56.42	211.45 ±38.53
C-HDL, mg/dl	64.61 ±12.37 <sup>a</sup>	55.14 ±15.35 <sup>b</sup>
C-LDL, mg/dl	135.65 ±38.39	130.81 ±30.27
Triacylglycerols, mg/dl	110.78 ±43.35	134.65 ±90.70
C-LDL/C-HDL	2.19 ±0.87	2.49 ±0.71
TC/C-HDL	3.40 ±1.16	4.01 ±0.97
Fasting glucose, mg/dl	93.27 ±20.60	97.65 ±17.91

<sup>a, b</sup>Statistically significant difference between women and men in the examined group at  $p < 0.05$ .

Table 3 shows the mean value of the energy supply and intake of macronutrients provided with DFRs of the patients and the percentages of reference daily intakes. The amount of energy supplied from the diet was insufficient in 48% of the women and 56% of the

men. Although the average intake of protein and fat in the men was within the normal range, 34% of them consumed an excess of those components. Among the women, 40% consumed excess protein and 29% provided excess fat in their diet. The average intake of carbohydrates was too low in the group of men, but it was observed that as many as 60% of the women consumed them in too small quantities. The share of energy from macronutrients was improperly balanced. There was an excessive proportion of energy from fat and protein. The amount of energy from carbohydrates was too low in 21% of the women and 32% of the men. The average intake of sucrose did not exceed the upper limit in any group, but as many as 29% of the women and 10% of the men exceeded it. The mean intake of dietary fiber was sufficient only in the men, but an insufficient fiber intake was observed in over 50% of the men and up to 74% of the women. The intake of cholesterol exceeded the upper limit in 40% of men. Among the women, only 5% were over the limit. An excessive intake of SFA in 45% of the women and 46% of the men simultaneous with too little supply of PUFA was worrying. The optimal supply of PUFA was reported for only 7% of the women and 6% of the men. The share of energy from SFA exceeded the recommended level in the vast majority of the women (65%) and men (78%) while a PUFA deficiency in 88% of the women and 74% of the men. Table 4 presents the average daily intake of minerals and vitamins in the DFRs of the examined and the percentage of fulfilment of the standards for these components. DFRs of the patients were deficient in potassium and calcium, whereas the women consumed an insufficient amount of magnesium. In both groups an excessive supply of sodium, phosphorus and copper was shown, and in the diet of the men an excess of iron was observed. Both the men and women's mean supply of vitamins D, C and folate was not enough. Although the average intake of vitamin A and E was in the normal range, as many as 33% of the women and 40% of the men consumed an insufficient amount of vitamin A, 46% of the women and 36% of the men consumed an insufficient amount of vitamin E. In both groups the average supply of riboflavin and vitamin B<sub>12</sub> exceeded the recommended allowance, just as that of vitamin B<sub>6</sub> in the group of men.

**Table 3.** Energy and macronutrients in DFR of patients

Nutrient	Examined group			
	women		men	
	$\bar{x} \pm SD$	% allowance uptake	$x \pm SD$	% allowance uptake
Energy, kcal	1 762.44 ±322.2 <sup>b</sup>	86	2 185.42 ±485.30 <sup>a</sup>	84
Energy, MJ	7.38 ±1.35 <sup>b</sup>	86	9.15 ±2.03 <sup>a</sup>	84
Protein, g	65.91 ±14.24 <sup>b</sup>	127	82.46 ±18.63 <sup>a</sup>	106
Fat, g	70.18 ±16.16 <sup>b</sup>	120	90.47 ±24.03 <sup>a</sup>	104
SFA, g	24.51 ±6.73 <sup>b</sup>	124	33.21 ±11.55 <sup>a</sup>	115
MUFA, g	24.52 ±6.54 <sup>b</sup>	106	33.98 ±10.51 <sup>a</sup>	98
PUFA, g	9.96 ±4.69 <sup>b</sup>	64	13.46 ±5.48 <sup>a</sup>	58
Dietary cholesterol, mg	244.70 ±76.77 <sup>b</sup>	82	337.43 ±152.77 <sup>a</sup>	112
Carbohydrates, g	229.56 ±46.98 <sup>b</sup>	89	269.36 ±68.77 <sup>a</sup>	72
Sucrose, g	49.86 ±23.79	112	47.15 ±20.12	73
Dietary fibre, g	17.76 ±5.09 <sup>b</sup>	74	20.79 ±5.96 <sup>a</sup>	86
Protein, % E	15.01 ±2.16	125	15.21 ±1.99	127
Fat, % E	35.81 ±4.58	119	37.16 ±4.79	124
SFA, % E	12.43 ±2.00	124	13.49 ±2.89	135
MUFA, % E	12.48 ±2.10 <sup>b</sup>	104	13.93 ±2.71 <sup>a</sup>	116
PUFA, % E	5.07 ±2.23	63	5.60 ±1.97	70
Carbohydrates, % E	52.12 ±4.92 <sup>a</sup>	90	49.44 ±6.31 <sup>b</sup>	85

<sup>a, b</sup>Statistically significant difference between women and men in the examined group at  $p < 0.05$ .

An analysis of the relationship between nutrition and the nutritional status showed that there was a statistically significant correlation ( $R = 0.48, p < 0.006$ ) between the LDL cholesterol level in the women and the energy supply in the diet and the percentage share of energy from protein. The high percentage of energy from protein correlated positively, while the total energy intake correlated inversely. A similar pattern was observed for the supply of energy and the total protein intake in the women ( $R = 0.50, p < 0.005$ ). In both groups a positive correlation between body weight and the level of dietary energy intake and energy from protein was also observed ( $R = 0.44, p < 0.02$  for the women,  $R = 0.51, p < 0.0009$  for the

men). The best results of body weight were recorded for energy supply about 1200–1400 kcal and protein at the level of 12–15% in men. Among women with energy supply at the level of 1200–1600 kcal and 10–14% energy from protein (Fig. 1 and 2). In addition, among the men, the total energy intake and energy percentage from protein ( $R = 0.43, p < 0.008$ ) correlated positively with BMI. The value of WC correlated with an increase of energy supply from protein and a decrease in calorie value ( $R = 0.42, p < 0.013$ ). In the men, it was also demonstrated that the level of TG correlated with an increase in dietary cholesterol and a decrease in energy value ( $R = 0.55, p < 0.0003$ ).

**Table 4.** Minerals and vitamins in DFR of patients

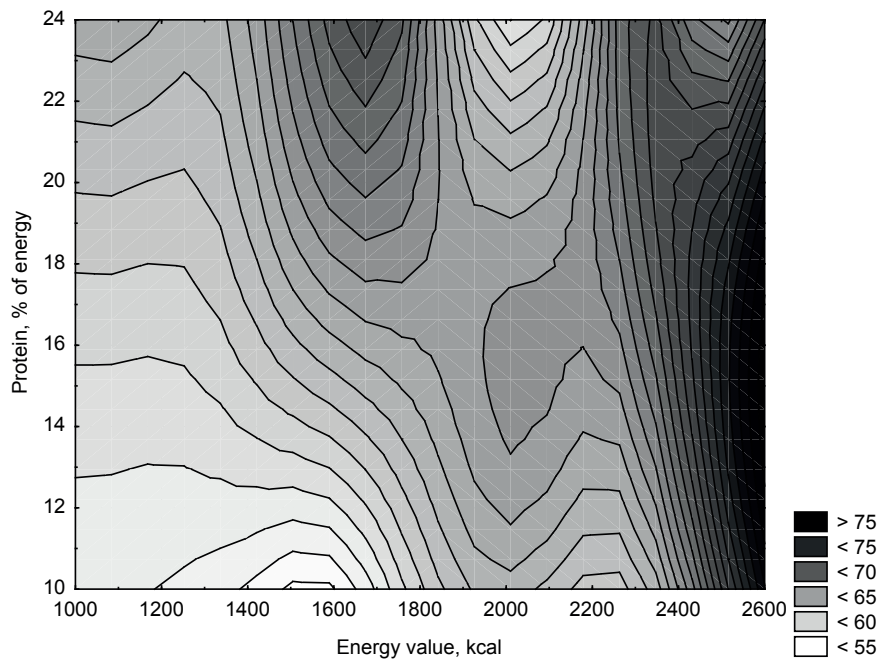
Nutrient	Examined group			
	women		men	
	$\bar{x} \pm SD$	% allowance uptake	$\bar{x} \pm SD$	% allowance uptake
Sodium, mg	1 739.59 ±442.50 <sup>b</sup>	124	2 441.24 ±748.69 <sup>a</sup>	173
Potassium, mg	2 825.99 ±788.54 <sup>b</sup>	60	3 208.46 ±763.34 <sup>a</sup>	68
Calcium, mg	537.11 ±150.06 <sup>b</sup>	46	636.00 ±255.53 <sup>a</sup>	63
Phosphorus, mg	1 031.60 ±253.94 <sup>b</sup>	147	1 318.94 ±329.07 <sup>a</sup>	188
Magnesium, mg	255.33 ±60.80 <sup>b</sup>	80	307.52 ±84.87 <sup>a</sup>	88
Iron, mg	9.68 ±2.28 <sup>b</sup>	90	11.92 ±3.11 <sup>a</sup>	119
Zinc, mg	8.63 ±1.85 <sup>b</sup>	108	11.34 ±3.13 <sup>a</sup>	103
Copper, mg	1.06 ±0.27 <sup>b</sup>	118	1.23 ±0.31 <sup>a</sup>	137
Vitamin A, µg	836.62 ±578.88	120	930.91 ±557.70	103
Vitamin D, µg	2.28 ±0.99 <sup>b</sup>	25	3.96 ±2.95 <sup>a</sup>	49
Vitamin E, mg	7.49 ±2.61 <sup>b</sup>	94	9.40 ±3.26 <sup>a</sup>	94
Thiamin, mg	0.97 ±0.26 <sup>b</sup>	89	1.26 ±0.36 <sup>a</sup>	97
Riboflavin, mg	1.31 ±0.32 <sup>b</sup>	120	1.62 ±0.44 <sup>a</sup>	124
Niacin, mg	13.20 ±4.04 <sup>b</sup>	94	16.22 ±4.98 <sup>a</sup>	101
Vitamin B <sub>6</sub> , mg	1.55 ±0.52 <sup>b</sup>	105	1.92 ±0.49 <sup>a</sup>	120
Folates, µg	181.02 ±54.12 <sup>b</sup>	45	207.27 ±57.91 <sup>a</sup>	52
Vitamin B <sub>12</sub> , µg	3.04 ±1.70 <sup>b</sup>	127	4.69 ±2.86 <sup>a</sup>	195
Vitamin C, mg	56.94 ±29.58	70	60.30 ±32.24	67

<sup>a, b</sup>Statistically significant difference between women and men in the examined group at  $p < 0.05$ .

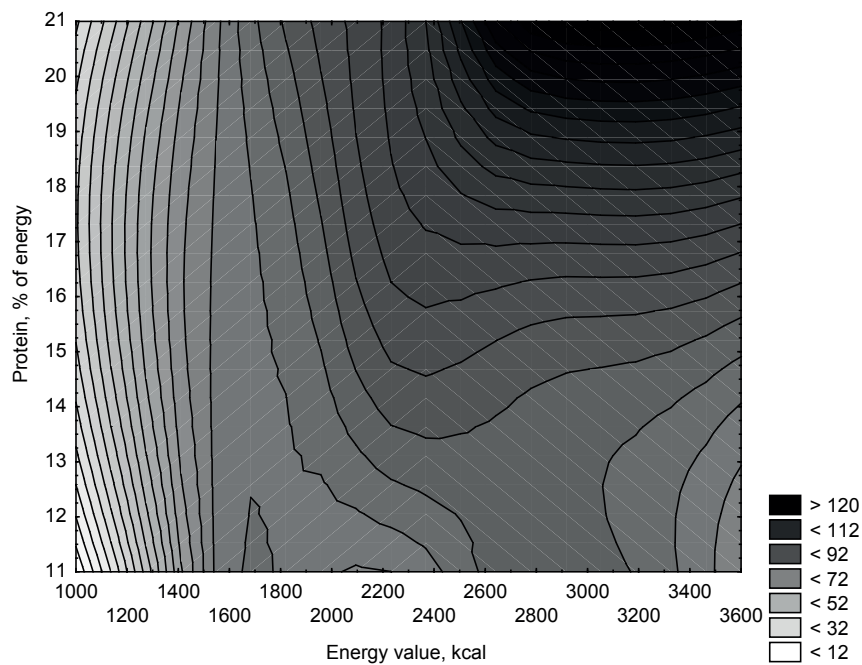
## DISCUSSION

The assessment of the nutritional status of the patients showed that a significant proportion of both the women and men aged 40+ was overweight or obese, which is confirmed by the observations of Polish and foreign researchers (Bronkowska and Sadowska, 2007; Mendis et al., 2011; Ogden et al., 2013; Terlikowska et al., 2012). At the same time, it was observed that a significant proportion of the men and women consumed an insufficient amount of energy from the diet. Probably, the patients deliberately cut down on the amount of food they ate. Similarly, an insufficient dietary energy

value was observed by other researchers (Bronkowska and Sadowska, 2007; Garriguet, 2008; Terlikowska et al., 2012). On the basis of WHR, abdominal obesity was diagnosed in over 60% of the women and 27% of the men. The fact that the WC value in the majority of both the women and men exceeded the limits is worrying. The results of this study correspond with the research by Terlikowska et al. (2012). In our study, abdominal obesity was more common among the women than the men. Similar results were obtained by Janghorbani et al. (2007), who stressed that this was particularly evident at an older age. High values of WC and WHR correlate with an increased



**Fig. 1.** Contour graph: body weight relative to energy value [kcal] and protein intake [% of energy], women



**Fig. 2.** Contour graph: body weight relative to energy value [kcal] and protein intake [% of energy], men



risk of atherosclerosis and CVDs (Klein et al., 2007; Report..., 2003). The analysis of the lipid profile of the patients allowed to identify hypercholesterolemia that was established on the basis of the high values of total cholesterol and the LDL cholesterol fraction. Fortunately, relatively high values of HDL cholesterol, which protects vascular endothelium against the development of atherosclerotic plaques (De Backer et al., 2003), are beneficial. It is not known, however, whether they are high enough in order to significantly reduce the risk of atherogenesis in patients with overweight and obesity, visceral adipose tissue distribution and an unbalanced diet. Although the average ratio of C-LDL/C-HDL was correct, the mean ratio of TC/C-HDL in the men was too high. At the same time, as many as 34% of the women had elevated levels of the TC/C-HDL ratio. Observational and intervention studies indicate that the risk is lowest when the TC/C-HDL ratio is <3.5 (Bersot et al., 2003). Abnormal concentrations of TC occurred with almost equal frequency in the women and men (68% and 65%, respectively). In epidemiological studies on the Polish population in the programmes WOBASZ (Pająk et al., 2005) and Pol-MONICA (Podolec et al., 2006) these disorders affected men more frequently. A much higher percentage of people with hypercholesterolemia was observed in the studies of POLKARD-SPOK (Główczyńska et al., 2005) and Maniecka-Bryła et al. (2010). In the surveyed population elevated LDL cholesterol level was more common in the men than women (67% and 37%, respectively). In the studies by Maniecka-Bryła et al. (2010) the incidence of these disorders was similar in women and men (63% and 69%, respectively). Values of HDL cholesterol lower than the recommended ones occurred with similar frequency among women and men (7% and 8%, respectively). Similarly results obtained in the studies by Maniecka-Bryła et al. (2010). Much greater prevalence of HDL disorders was obtained in the WOBASZ studies (Pająk et al., 2005). In the studied population a fairly common problem was an increased TG concentration, which concerned almost equally men and women (22% and 27%, respectively). The prevalence of TG disorders in the study population was similar to the data for the Polish population (31% of men, 20% of women) (Pająk et al., 2005). The problem of lipid disorders is also widely prevalent in European countries and in the

world, which is confirmed by numerous studies (Al-Kaabba et al., 2012; Cai et al., 2012; Scheidt-Nave et al., 2013).

The subjects also struggled with elevated fasting glucose level, which was diagnosed in 22% of the women and 35% of the men. According to the WHO (Mendis et al., 2011), impaired fasting glucose is a predisposing factor for future development of diabetes, which is a major risk factor of CVDs.

Besides the adverse nutritional status, diets also contribute to an increased risk of developing the atherosclerotic process. Although the average energy value of DFRs was similar to the accepted standards, the diets were poorly balanced. Most people had a high level of protein and fat intake compared to the production of energy from carbohydrates. It should be noted that the excessive intake of protein, and, in particular, that of animal origin, may be an atherogenic factor due to the high content of both fat and methionine in animal products. Methionine is an amino acid, which leads to increased blood levels of homocysteine, which has an atherogenic effect (Gąsiorowska et al., 2008; Wichlińska-Lipka and Nyka, 2008). Konukoğlu et al. (2003) point out that among obese people even normal levels of homocysteine can damage the endothelium, and lead to oxidative stress and, consequently, the development of atherosclerotic plaque. In our study, we found a positive correlation between the energy from protein and energy in the diet and body weight in the women and men. In addition, among the men protein intake was positively correlated with BMI and WC. The conclusion that protein intake is conducive to obesity is not entirely original. Similar observations were made by Trichopoulou et al. (2002) and McCarty (2000), who hypothesised that protein intake may be the main underlying reason for the increasing occurrence of obesity in the Western world. In our study, a correlation between the level of energy from protein and energy supply and the concentration of C-LDL in the blood of the women was also found. However, one should bear in mind the potential adverse effects of animal protein and favorable ones of vegetable protein on the lipid profile (Kritchevsky, 1995; Reiner et al., 2011; Van Raaij et al., 1981).

What is particularly worrying is the fact that the high levels of fat intake that exceeded 30% of the energy value of the diet. Given the presence of the multiple

risk factors for CVDs in the population, these values should be even lower. The high level of SFA consumption is also unfavourable because of raises the level of TC and C-LDL (Reiner et al., 2011; Report..., 2003; Skeaff and Miller, 2009). According to the report of ATP III (National cholesterol..., 2002), substitution of SFA by MUFA may partially compensate for their high supply, but a low intake of PUFA is an additional risk factor for atherosclerosis in the study group.

An important role in the development of atherosclerosis is also played by an increased intake of dietary cholesterol, which increase level of C-LDL (Jarosz, 2012; Reiner et al., 2011). Moreover, persons with hypercholesterolemia are more sensitive to an excess of cholesterol in the diet. It can, therefore, be assumed that in the group of men with known lipid abnormalities, an oversupply of cholesterol will have adverse clinical implications in the form of an even greater increase in C-LDL. Fortunately for the women, only a small percentage of them exceeded the upper limit. The present study revealed a positive correlation between the supply of cholesterol and TG levels in the men's blood, but it requires further investigation.

Attention should be paid to the low intake of dietary fiber. It has been proven that the water soluble fiber reduces the concentration of C-LDL serum, promotes the reduction of the LDL-C/HDL-C ratio, increases excretion of short chain volatile fatty acids that inhibit the activity of hepatic HMGCoA reductase, which causes an increase in the hepatic cholesterol demand required for the synthesis of these acids. Consequently, it reduces the serum concentration of TC and increases the endogenous synthesis. Dietary fiber also reduces postprandial glycemia (Jarosz, 2012; Jenkins et al., 1993; Macintosh and Miller, 2001; Ötles and Ozgoz, 2014; Reiner et al., 2011).

The results of this study indicate a high percentage of people who consume insufficient amounts of antioxidant vitamins, which have the ability to limit the formation of free radicals, lipid peroxides and modification of LDL and lowering TC concentration in the blood (Asplund, 2002; Kłosiewicz-Latoszek et al., 2008; Waśkiewicz and Sygnowska, 2008).

Another problem is an insufficient intake of folate, which next to excessive protein intake may promote the increase in homocysteine concentration in blood plasma and thus increase the risk of CVDs

(Wichlińska-Lipka and Nyka, 2008). The fact that the intake of other triplet's vitamins responsible for the increase concentration of homocysteine, i.e. vitamin B<sub>6</sub> and B<sub>12</sub>, was sufficient is comforting.

In the present study, there was also an inadequate intake of potassium, calcium and, in women, magnesium, simultaneous with an excessive sodium intake, which may lead to the occurrence of hypertension (Waśkiewicz and Sygnowska, 2008). Vasconen (2003) stresses that mineral nutrients, such as calcium, potassium and magnesium, lower blood pressure, and calcium especially has beneficial effects on serum lipids and may help in weight control, as well.

Similar errors in the diet, unfavourable from the viewpoint of the atherogenesis threat, were also observed by other researchers (Bronkowska and Sadowska, 2007; Terlikowska et al., 2012; Waśkiewicz and Sygnowska, 2008; Waśkiewicz et al., 2005).

## CONCLUSIONS

Our study indicates that inadequate nutrition among the study population both men and women represents a real health danger of developing of atherosclerotic plaque. It should be stressed that there is a need for nutrition education in the age group of 40+ to modify diet properly.

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## MIĘDZYPLCIOWE RÓŻNICE W SPOSOBIE ŻYWIENIA W ASPEKTCIE ZAGROŻENIA ATEROGENEZĄ W POLSCE

### STRESZCZENIE

**Wstęp.** Dieta odgrywa istotną rolę w zapobieganiu miażdżycy. Celem badania była ocena różnic w sposobie żywienia oraz stanie odżywienia kobiet i mężczyzn w aspekcie ryzyka miażdżycy.

**Materiał i metody.** W badaniu wzięło udział 41 kobiet i 49 mężczyzn w wieku 40+. Spożycie składników odżywczych oceniono metodą bieżącego notowania (zapis 7-dniowy). Stan odżywienia określono na podstawie pomiarów antropometrycznych i parametrów biochemicznych krwi. Różnice między składem diety i stanem odżywienia, zależne od płci, oceniono za pomocą jednoczynnikowej analizy wariancji. Zależności pomiędzy stanem odżywienia a czynnikami żywieniowymi stwierdzono za pomocą regresji wielokrotnej.

**Wyniki i dyskusja.** Znaczna część kobiet i mężczyzn miała nadwagę bądź otyłość, zaburzenia lipidowe i nieprawidłowe stężenie glukozy na czczo. Diety kobiet i mężczyzn były źle zbilansowane. U kobiet stwierdzono istotną korelację między poziomem energii z białka i podażą energii a cholesterolem frakcji LDL. Pozytywną korelację pomiędzy energią z białek i całkowitą podażą energii a masą ciała stwierdzono u kobiet i mężczyzn. Ponadto spożycie białka było skorelowane dodatnio z BMI oraz obwodem talii u mężczyzn. Także u mężczyzn, poziom triacylogliceroli w surowicy korelował ze wzrostem spożycia cholesterolu i zmniejszaniem wartości energetycznej.

**Wnioski.** Badanie wskazuje, że niewłaściwa dieta zarówno wśród mężczyzn, jak i kobiet jest realnym zagrożeniem zdrowia, powodując rozwój blaszki miażdżycowej.

**Słowa kluczowe:** zaburzenia lipidowe, stan odżywienia, sposób żywienia, miażdżycyca

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